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- 547\1. A method for measuring registration errors and chromatic aberration in video signals, said video signals being represented as least first and second color signals and said registration errors and chromatic aberration appearing as misaligned edges of the first and second color signals in an image reproduced from the video signals, the method comprising the steps of:
- a) selecting a first set of N samples of the first color signal and a second set of N samples of the second color signal, where N is an integer greater than 2;
- b) analyzing the set of samples of the first color signal to determine whether the first set of samples contains M samples representing an edge in the image, where M is an integer less than N, and storing the first and second sets of samples if the first set of samples is determined to contain the M samples representing the edge; and
- c) comparing the stored first set of samples to the stored second set of samples to determine a displacement between the M samples in the first set of samples with M corresponding samples in the second set of samples.
- A method according to claim 1, wherein step a) further includes the 2. steps of:

calculating a measure of color balance between the first set of samples and the second set of samples; and

discarding the first and second sets of samples if the measure of color balance has a value which is not within a predetermined range.

A method according to claim 2, wherein the first and second sets of samples represent image picture elements (pixels) in a line of the image and step a) further includes the steps of:

selecting third and fourth sets of samples of said first color signal, each of the samples in the third and fourth sets of samples corresponding to a pixel which is immediately adjacent to a respective pixel element in said first set of samples;

analyzing the first, third and fourth sets of samples to determine whether the first set of samples is adjacent to an edge which is parallel to the line of the image or represent an edge which intersects the line of the image on a diagonal; and

	10	discarding the first, second, third and fourth sets of samples if the first set
	11	of samples is adjacent to the parallel edge or represents the diagonal edge.
	1	A method according to claim 1, wherein M equals 2 and step b)
	2	includes the steps of:
	3	calculating difference values between successive ones of the samples in
	4	the first set of samples;
	5	comparing each of the calculated difference values to an edge threshold
le Car day day day can day	6	value; and
	7	indicating that the set of samples represents an edge if any of the
	8	calculated difference values is greater than the edge threshold value.
	1	5. A method according to claim 1, wherein step c) includes the steps of:
	2	performing a cross correlation between the stored first set of samples and
1	3	the stored second set of samples to identify a coarse displacement between respective
IJ	4	edges in the first and second sets of samples to a nearest intersample distance;
#	5	selecting the M samples from the stored first set of samples and M
j	6	corresponding samples from the stored second set of samples, wherein each of the
Į.	7	samples from the second set is displaced by the identified displacement from the
h the mater than the	8	respective sample in the first set;
	9	interpolating S samples between successive ones of the M samples of each
	10	of the first and second sets of samples, where S is an integer;
	11	performing a cross correlation between the respective M original and
	12	interpolated samples of the first and second sets of samples to identify a fine
	13	displacement between the first and second sets of samples which is less than one
	14	intersample distance of the original samples from a central sample of the M samples of
	15	the first set of samples; and
	16	combining the coarse displacement and the fine displacement to obtain the
	17	measure of the registration errors and chromatic aberration errors in the video signals.
	1	6. A method according to claim 1, wherein step c) includes the steps of:
	2	performing a cross correlation between the stored first set of samples and

the stored second set of samples to identify a coarse displacement between respective

edges in the first and second sets of samples to a nearest intersample distance and storing a correlation value at each displacement considered in the cross correlation; 5 selecting at least three of the stored correlation values including the 6 correlation value corresponding to the identified displacement; 7 fitting a parabolic curve to the selected correlation values; 8 determining a maximum point of the parabolic curve as a fine 9 displacement; and 10 combining the coarse displacement and the fine displacement to obtain the 11 measure of the registration errors and chromatic aberration errors in the video signals. 12 7. A method according to claim 1, wherein step c) includes the steps of: 1 generating respective measures of sum of absolute difference between the M samples of the first stored set of samples and M samples of the second stored set of samples for respectively different displacements between the first stored set of samples and the second stored set of samples; identifying a coarse displacement as the sum of absolute difference measures which is less than or equal to any other one of the sum of absolute difference 7 J 8 measures; П selecting the M samples from the stored first set of samples and M i<del>≐</del> 10 corresponding samples from the stored second set of samples, wherein each of the samples from the second set is displaced by the coarse displacement from the respective 11 sample in the first set; 12 interpolating S samples between successive ones of the M samples of each 13 of the first and second sets of samples, where S is an integer; 14 performing a cross correlation between the respective Moriginal and S 15 interpolated samples of the first and second sets of samples to identify a fine 16 displacement between the first and second sets of samples which is less than one 17 intersample distance of the original samples from a central sample of the M samples of 18 the first set of samples; and 19 combining the coarse displacement and the fine displacement to obtain the 20

measure of the registration errors and chromatic aberration errors in the video signals.

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8. A method according to claim 1, wherein step c) includes the steps of: 1 generating respective measures of sum of absolute difference between the 2 M samples of the first stored set of samples and M samples of the second stored set of 3 samples for respectively different displacements between the first stored set of samples 4 and the second stored set of samples; 5 identifying a coarse displacement as the sum of absolute difference 6 measures which is less than or equal to any other one of the sum of absolute difference 7 measures; 8 selecting at least three of the measures of sum of absolute difference 9 including the measure corresponding to the coarse displacement; 10 11 12 13 13 13 14 fitting a parabolic curve to the selected measures; determining a minimum point of the parabolic curve as a fractional intersample distance to be combined with the identified displacement to produce the measured displacement value. 14 9. Apparatus for measuring registration errors and chromatic aberration in video signals, said video signals being represented as least first and second 2 color signals and said registration errors and chromatic aberration appearing as misaligned edges of the first and second color signals in an image reproduced from the video signals, the method comprising: means for selecting a first set of N samples of the first color signal and a 6 second set of N samples of the second color signal, where N is an integer greater than 2; 7 a video memory; 8 means for analyzing the set of samples of the first color signal to 9 determine whether the first set of samples contains M samples representing an edge in 10 the image, where M is an integer less than N, and storing the first and second sets of 11 samples in the video memory if the first set of samples is determined to contain the M 12 13 samples representing the edge; and

means for comparing the stored first set of samples to the stored second set of samples to determine a displacement between the M samples in the first set of samples with M corresponding samples in the second set of samples.

	1	10. Apparatus according to claim 9, wherein the means for selecting
	2	further includes:
	3	means for calculating a measure of color balance between the first set of
	4	samples and the second set of samples; and
	5	means for inhibiting the storage of the first and second sets of samples
	6	into the memory if the measure of color balance has a value which is not within a
	7	predetermined range.
	1	11. Apparatus according to 10, wherein the first and second sets of
	2	samples represent image picture elements (pixels) in a line of the image and the means
	3	for selecting further includes:
	4	means for selecting third and fourth sets of samples of said first color
Ď	5	signal, each of the samples in the third and fourth sets of samples corresponding to a
	6	pixel which is immediately adjacent to a respective pixel element in said first set of
CHAPTER ENTE	7	samples;
IU IA	8	means for analyzing the first, third and fourth sets of samples to determine
ì	9	whether the first set of samples is adjacent to an edge which is parallel to the line of the
The Car	10	image or represent an edge which intersects the line of the image on a diagonal; and
	11	means for inhibiting the storage of the first and second sets of samples if
	12	the first set of samples is determined to be adjacent to the parallel edge or represents the
: -	13	diagonal edge.
	1	12. Apparatus according to claim 9, wherein M equals 2 and the means for
	2	analyzing includes:
	3	means for calculating difference values between successive ones of the
	4	samples in the first set of samples;
	5	means for comparing each of the calculated difference values to an edge
	6	threshold value to indicate that the set of samples represents an edge if any of the
	7	calculated difference values is greater than the edge threshold value.
	1	5 A67 13. A method according to claim 9, wherein the means for comparing
	2	includes:

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displacement; and

first correlation means for performing a cross correlation between the stored first set of samples and the stored second set of samples to identify a coarse 4 displacement between respective edges in the first and second sets of samples to a 5 nearest intersample distance; 6 means for selecting the M samples from the stored first set of samples and 7 M corresponding samples from the stored second set of samples, wherein each of the 8 samples from the second set is displaced by the identified displacement from the 9 respective sample in the first set; 10 means for interpolating S samples between successive ones of the M 11 samples of each of the first and second sets of samples, where S is an integer; 12 second correlation means for performing a cross correlation between the **13** respective M original and S interpolated samples of the first and second sets of samples 15 16 17 18 to identify a fine displacement between the first and second sets of samples which is less than one intersample distance of the original samples from a central sample of the M samples of the first set of samples; and means for combining the coarse displacement and the fine displacement to 18 19 obtain the measure of the registration errors and chromatic aberration errors in the video 20 signals. 14. Apparatus according to claim 9, wherein the means for comparing includes: means for performing a cross correlation between the stored first set of 3 samples and the stored second set of samples to identify a coarse displacement between 4 respective edges in the first and second sets of samples to a nearest intersample distance 5 and storing a correlation value at each displacement considered in the cross correlation; 6 means for selecting at least three of the stored correlation values including 7 the correlation value corresponding to the identified displacement: 8 means for fitting a parabolic curve to the selected correlation values; 9 means for determining a maximum point of the parabolic curve as a fine 10

means for combining the coarse displacement and the fine displacement to 12 obtain the measure of the registration errors and chromatic aberration errors in the video 13 signals. 14 15. Apparatus according to claim 9, wherein the means for comparing 1 includes: 2 means for generating respective measures of sum of absolute difference 3 between the M samples of the first stored set of samples and M samples of the second 4 stored set of samples for respectively different displacements between the first stored set 5 of samples and the second stored set of samples; 6 means for identifying a coarse displacement as the sum of absolute 7 difference measures which is less than or equal to any other one of the sum of absolute 8 9 10 11 11 12 difference measures; means for selecting the M samples from the stored first set of samples and M corresponding samples from the stored second set of samples, wherein each of the samples from the second set is displaced by the coarse displacement from the respective 13 sample in the first set; 13 14 15 15 means for interpolating S samples between successive ones of the M samples of each of the first and second sets of samples, where S is an integer; means for performing a cross correlation between the M original and S **1**6 interpolated samples of the first and second sets of samples, respectively, to identify a l<del>≠</del> 17 fine displacement between the first and second sets of samples which is less than one 18 intersample distance of the original samples from a central sample of the M samples of 19 20 the first set of samples; and means for combining the coarse displacement and the fine displacement to 21 obtain the measure of the registration errors and chromatic aberration errors in the video 22 signals. 23 16. Apparatus according to claim 9, wherein the means for comparing 1 includes: 2 means for generating respective measures of sum of absolute difference 3

between the M samples of the first stored set of samples and M samples of the second

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stored set of samples for respectively different displacements between the first stored set 5 of samples and the second stored set of samples; 6 means for identifying a coarse displacement as the sum of absolute 7 difference measures which is less than or equal to any other one of the sum of absolute 8 difference measures; 9 means for selecting at least three of the measures of sum of absolute 10 11 difference including the measure corresponding to the coarse displacement; means for fitting a parabolic curve to the selected measures; 12 13 means for determining a minimum point of the parabolic curve as a fractional intersample distance to be combined with the identified displacement to 14 15 15 The same of produce the measured displacement value.